

Patent claims

1. A method for testing the integrity of objects formed as closed hollow bodies having air inside the same, in particular closed packages such as film bags (10), cup packages (11) with a closure film, etc., by means of vacuum, characterized by the following features:
  - a) the articles or packages (10, 11) are preferably transported continuously along a conveying path,
  - b) during a transport section, the articles or packages (10, 11) are accommodated in a testing chamber (13) running along with the package (10, 11) or with a group of the same to be tested,
  - c) the testing chamber (13) has a vacuum applied to it in the region of a defined testing section or testing station,
  - d) the testing chamber (13) is sealed off on all sides, in particular in conjunction with a package conveyor (14),
  - e) any deformations of the article or the package (10, 11) in the testing chamber (13) and/or after leaving the same are scanned.
2. The method as claimed in claim 1, characterized by the following features:
  - a) a formed group of objects or packages (10, 11), specifically a testing group (18) comprising longitudinal rows and transverse rows (23) of objects or packages (11) is checked simultaneously in the testing chamber (13) during the transport,
  - b) each object or each package (10, 11) is checked by an associated testing element or a sensor (28),

- c) faulty or non-sealed objects or packages (10, 11) are identified and separated out of the testing group (18),
- e) in the place of the faulty object or the package (10, 11) separated out, an intact, sealed pack (10, 11) is positioned at the same position within the testing group (18).

3. A device for testing the integrity of objects formed as closed hollow bodies having air inside the same, in particular closed packages such as film bags (10), cup packages (11) with a closure film, etc., by means of vacuum, characterized by the following features:

- a) during the preferably continuous transport in the testing chamber (13) running along in the transport direction together with the packages (10, 11), the packages (10, 11) have vacuum applied to them,
- b) the packages (10, 11), in particular a testing group (18) comprising a plurality of packages (10, 11) arranged in transverse rows (23), are arranged on a package conveyor (14) and can be moved by the latter along a testing section or through a testing station,
- c) in the region of the testing section or testing station, at least one sealing element can be moved into a testing position and, in conjunction with the package conveyor (14) and/or further limits, forms the closed testing chamber (13),
- d) the testing chamber (13) can have vacuum applied to it for some time, specifically in the region of the testing section or testing station,
- e) the packages (10, 11) can be checked by sensors (28) with respect to correct formation within the testing chamber (13) or after leaving the same.

4. The device as claimed in claim 3, characterized in that the testing chamber (13) is delimited by the package conveyor (14), the one hand, and a covering hood (18) which can be placed on the package conveyor (14) in a sealing manner, the covering hood (18) being connected to a vacuum source (33), preferably via a suction line (32) or a suction pipe (31).
5. The device as claimed in claim 3 or 4, characterized in that, at least in the region of a conveying run (17) for accommodating the packages (10, 11), the package conveyor (14) forms a flat supporting surface for the packages (10, 11) which can be pressure-loaded, in particular in the embodiment of the package conveyor (14) as a plate chain.
6. The device as claimed in claim 3 or one of the further claims, characterized in that the covering hood (18) can be moved up and down by a hood conveyor (29) and can also be moved to and fro in the direction of movement of the package conveyor (14).
7. The device as claimed in claim 6 or one of the further claims, characterized in that the covering hood (18) is in particular fitted with an upright suction pipe (31) that can be moved up and down on a linear drive (35) running parallel to the package conveyor (14), in particular by means of a carriage (34) on a horizontal servo axle.
8. The device as claimed in claim 4 or one of the further claims, characterized in that each package (10, 11) can be registered with respect to a shape change in the region of the testing chamber (13), in particular by means of sensors (28) arranged outside the covering hood (18), preferably laser

sensors operating in accordance with the triangulation principle, which are arranged above a translucent or clear-view upper wall (24) of the covering hood (18) corresponding to the formation of the packages (10, 11).

9. The device as claimed in claim 4 or one of the further claims, characterized in that, outside the region of the testing chamber (13), packages (10, 11) identified as faulty can be conveyed away from the formation of the testing group (18) by a conveyor, in particular a lifting conveyor (41), and can be replaced by a correct, intact package (10, 11) by means of a filling conveyor (78).
10. The device as claimed in claim 4 or one of the further claims, characterized in that an element delimiting the testing chamber (13), in particular a package conveyor (14) and/or a lateral limit, can be moved at the conveying speed of the packages (10, 11) to be tested and has air-permeable suction regions (22) which are each assigned to a package (10, 11) and can be moved past at least one suction unit (23), preferably arranged in a fixed location, in order to produce a temporary vacuum in the testing chamber (13).
11. The device as claimed in claim 4 or one of the further claims, characterized in that the testing chamber (13) is formed in the region of a testing channel (76), the testing channel (76) being delimited by the package conveyor (14) and by side and upper walls, and the testing chambers (13) are delimited by movable, transversely oriented dividing elements within the testing channel (76), in particular by dividing walls (51) or transverse walls (62) or intermediate walls (70) that can be moved with the package conveyor (14).

12. The device as claimed in claim 4 or one of the further claims, characterized in that the package conveyor (14) is constructed as a rotationally driven conveying disk (43), on which the packages (10, 11) can be conveyed along part of a circle, a testing channel (76) being delimited laterally by an inner wall (49) or a circular supporting element (72), radially on the outside by a preferably stationary guide plate (50), on the upper side by a mating disk (48) or upper wall (67), and testing chambers (13) within the part-circular testing channel (76) being delimited by movable dividing walls (51) or transverse walls (62) or intermediate walls (70).
13. The device as claimed in claim 12 or one of the further claims, characterized in that the suction unit (23), in particular a suction bell (56), is arranged in an internal space (57), and the circular inner wall (49) or the supporting element (72) of each testing chamber (13) has associated openings or suction holes (59) or suction ducts (75), which can be moved past the fixed-location suction unit (23) by means of rotation of the conveyor disk (43) or the inner wall (49) or supporting element (73).
14. The device as claimed in claim 12 or one of the further claims, characterized in that, in order to delimit the testing chambers (13) transversely in the region of the testing channel (76), dividing walls (51) or intermediate walls (70) are designed to be pivotable, specifically are in particular connected to a pivoting shaft (52) or a rotary journal (71) that can be rotated under control, in order to move the dividing walls (51) or intermediate walls (70) in the region of the testing channel (76) from an initial position

pointing approximately in the circumferential direction into a sealing transverse position.

15. The device as claimed in claim 4 or one of the further claims, characterized in that the package conveyor (14) constructed as a belt is guided in a curve, in particular in the shape of a quarter-circle, transverse limits for a quarter-circular testing channel (76) being radially oriented transverse walls (62), which are fitted to a rotating body (64) in the manner of a star and can be introduced into the testing channel (76) one after another as a result of movement of the rotating body (64), forming testing chambers (13).
16. The device as claimed in claim 15 or one of the further claims, characterized in that the testing channel (76) is delimited by the curved, in particular quarter-circular, package conveyor (14) having suction regions (22), by an inner surface (65) of the rotating body (64), by an external, stationary guide plate (50) and on the upper side by an upper wall (67) preferably connected to the rotating body (64).